UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,100	06/02/2005	Tomohiro Akiyama	0054-0294PUS1	1254

2292 7590 10/15/2009

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER
LI, SHI K

ART UNIT	PAPER NUMBER
2613	

NOTIFICATION DATE	DELIVERY MODE
10/15/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/537,100	AKIYAMA ET AL.	
	Examiner	Art Unit	
	Shi K. Li	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) *306* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 7-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 29 July 2009 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. (Japan Patent Application Pub. JP406276017) in view of Riza (U.S. Patent 5,187,487).

Regarding claim 1, Kobayashi et al. discloses in FIG. 3 an antenna feeding circuit. FIG. 3 comprises first optical demultiplexer 44_{11}, second optical demultiplexer 44_{13}, first optical frequency converter (frequency shifter) 49_1, second optical frequency converter 49_3, optical multiplexer 13, the output of which travel a single coaxial optical path, optical synthesizer 31, beam synthesizer 44 and a plurality of optoelectronic converters 53. The difference between Kobayashi et al. and the claimed invention is that Kobayashi et al. does not teach a spatial optical modulator. Riza teaches in FIG. 2 an apparatus for driving an antenna array. Riza teaches in FIG. 2 device 144 for controlling the beam width and spatial light modulator (SLM) 170 for

adjusting the phase of the beams before the beams are superimposed with a reference beam. Kobayashi et al. also teaches a similar approach by adjusting the reference beams which has equivalent effect of adjusting the frequency shifted beams. One of ordinary skill in the art would have been motivated to combine the teaching of Riza with the antenna feeding circuit of Kobayashi et al. because the pixel array of the SLM corresponds to the antenna array so that a separate selectively phase delayed signal light beam is generated for each antenna element in the antenna array to be individually controlled. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a SLM for adjusting the phase of light beams, as taught by Riza, in the antenna feeding circuit of Kobayashi et al. because the pixel array of the SLM corresponds to the antenna array so that a separate selectively phase delayed signal light beam is generated for each antenna element in the antenna array to be individually controlled.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. and Riza as applied to claim 1 above, and further in view of Izadpanah et al. (U.S. Patent 7,020,396 B2) and Hong et al. (U.S. Patent 4,965,603).

Kobayashi et al. and Riza have been discussed above in regard to claim 1. Furthermore, Kobayashi et al. teaches in FIG. 3 Fourier transform lens 46 and optical transmission lines 48. It is well known in the art that fiber is a popular transmission line for optical signal. The difference between Kobayashi et al. and Riza and the claimed invention is that Kobayashi et al. and Riza teach phase modulation instead of intensity modulation. Izadpanah et al. teaches in FIG. 2 an optic-electronic ultra-wideband radio waveform generator. Izadpanah et al. teaches in FIG. 2 SLM 204 for modulating at least one of phase and amplitude. That is, Izadpanah et al. considers

phase modulation and amplitude modulation provides equivalent function. Each of them may have minor difference from the other and more desirable for particular applications. Hong et al. provides another example of using amplitude modulation. Where the claimed differences involve the substitution of interchangeable or replaceable equivalents and the reason for the selection of one equivalent for another was not to solve an existent problem, such substitution has been judicially determined to have been obvious. See In re Ruff, 118, USPQ 343 (CCPA 1958). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to replace phase modulation with intensity modulation.

Since Kobayashi et al. teaches Fourier transform lens 46 along the reference beams, the Examiner cites Hong et al. to teach that the Fourier transform lens can be placed along the modulated beam. Hong et al. teaches in FIG. 1 an antenna feeder comprising SLM 24 and Fourier transform lens 26. The references, considered as a whole, suggest that the SLM and Fourier transform lens can be placed along the reference beams or the modulated beams and provide equivalent effects. Choosing of one over the other is an engineering choice that is obvious to one of ordinary skill in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to place a Fourier transform lens along the modulated beams.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. and Riza as applied to claim 1 above, and further in view of Bouzid et al. (U.S. Patent 6,038,076).

Kobayashi et al. and Riza have been discussed above in regard to claim 1. The difference between Kobayashi et al. and Riza and the claimed invention is that Kobayashi et al. and Riza do

not teach the structure of the multiplexer. Bouzid et al. teaches in FIG. 1 a multiplexer comprising a first prism 31 and a second prism 24. One of ordinary skill in the art would have been motivated to combine the teaching of Bouzid et al. with the modified antenna feeding circuit of Kobayashi et al. and Riza because the prisms of Bouzid et al. are oriented to operate at or near Brewster's angles, so that insertion loss is minimal. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use two prisms to form a multiplexer, as taught by Bouzid et al., in the modified antenna feeding circuit of Kobayashi et al. and Riza because the prisms of Bouzid et al. are oriented to operate at or near Brewster's angles, so that insertion loss is minimal.

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. and Riza as applied to claim 1 above, and further in view of Takushima et al. (U.S. Patent 6,810,170 B2).

Kobayashi et al. and Riza have been discussed above in regard to claim 1. The difference between Kobayashi et al. and Riza and the claimed invention is that Kobayashi et al. and Riza do not teach the structure of the multiplexer. Takushima et al. teaches multiplexers. In particular, Takushima et al. teaches in FIG. 5 a multiplexer comprising a first diffraction grating 221 and second diffraction grating 211 and a single coaxial optical path 90. One of ordinary skill in the art would have been motivated to combine the teaching of Takushima et al. with the modified antenna feeding circuit of Kobayashi et al. and Riza because the each wavelength in the multiplexer has a different optical path length and chromatic dispersion in these light components can be adjusted. Furthermore, the optical fibers 90 to 94 having no collimator function can be used; hence the multiplexer can be inexpensive. Thus it would have been

obvious to one of ordinary skill in the art at the time the invention was made to use the multiplexer of Takushima et al. in the modified antenna feeding circuit of Kobayashi et al. and Riza because the each wavelength in the multiplexer has a different optical path length and chromatic dispersion in these light components can be adjusted.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al., Riza and Izadpanah et al. as applied to claim 2 above, and further in view of Takushima et al. (U.S. Patent 6,810,170 B2).

Kobayashi et al., Riza and Izadpanah et al. have been discussed above in regard to claim 1. The difference between Kobayashi et al., Riza and Izadpanah et al. and the claimed invention is that Kobayashi et al., Riza and Izadpanah et al. do not teach the structure of the multiplexer. Bouzid et al. teaches in FIG. 1 a multiplexer comprising a first prism 31 and a second prism 24. One of ordinary skill in the art would have been motivated to combine the teaching of Bouzid et al. with the modified antenna feeding circuit of Kobayashi et al., Riza and Izadpanah et al. because the prisms of Bouzid et al. are oriented to operate at or near Brewster's angles, so that insertion loss is minimal. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use two prisms to form a multiplexer, as taught by Bouzid et al., in the modified antenna feeding circuit of Kobayashi et al., Riza and Izadpanah et al. because the prisms of Bouzid et al. are oriented to operate at or near Brewster's angles, so that insertion loss is minimal.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al., Riza and Izadpanah et al. as applied to claim 2 above, and further in view of Takushima et al. (U.S. Patent 6,810,170 B2).

Kobayashi et al., Riza and Izadpanah et al. have been discussed above in regard to claim 2. The difference between Kobayashi et al., Riza and Izadpanah et al. and the claimed invention is that Kobayashi et al., Riza and Izadpanah et al. do not teach the structure of the multiplexer. Takushima et al. teaches multiplexers. In particular, Takushima et al. teaches in FIG. 5 a multiplexer comprising a first diffraction grating 221 and second diffraction grating 211 and a single coaxial optical path 90. One of ordinary skill in the art would have been motivated to combine the teaching of Takushima et al. with the modified antenna feeding circuit of Kobayashi et al., Riza and Izadpanah et al. because the each wavelength in the multiplexer has a different optical path length and chromatic dispersion in these light components can be adjusted. Furthermore, the optical fibers 90 to 94 having no collimator function can be used; hence the multiplexer can be inexpensive. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the multiplexer of Takushima et al. in the modified antenna feeding circuit of Kobayashi et al., Riza and Izadpanah et al. because the each wavelength in the multiplexer has a different optical path length and chromatic dispersion in these light components can be adjusted.

Response to Arguments

9. Applicant's arguments filed 29 July 2009 have been fully considered but they are not persuasive.

The Applicant argues:

"it is respectfully submitted that neither Kobayashi nor Riza, alone or in combination, teaches or suggests all claim limitations."

"For example, claim 1 recites, inter alia, "an optical multiplexer for converting the first and second signal light beams different in wavelength outputted from the spatial optical modulator into a single multiplex output signal light beam to travel through one and same coaxial optical path.""

"It is respectfully submitted that neither Kobayashi nor Riza teaches the above-identified claim feature."

"Kobayashi is directed to a conventional antenna feeder circuit that is concerned with multi-beam formation in which directions of a plurality of beams are determined based on positions of masks, respectively. Kobayashi's antenna feeder circuit includes two or more laser light sources, an optical distributor, a spatial light modulation device, a laser beam modulator, and an optical multiplexer 13."

"The Examiner relies on the optical multiplexer 13 of Kobayashi as disclosing the above-identified claim feature. It is respectfully submitted that the optical multiplexer 13 of Kobayashi does not convert a first and second signal light beams different in wavelength outputted from a spatial optical modulator into a single multiplex output signal light beam to travel through one and same coaxial optical path."

"Contrary to the claimed invention, multiplexer 13 of Kobayashi multiplexes an optical signal generated with each modulator, and outputs to each radiating element correspondence of the array antenna. Then, a light/electric transducer changes the optical signal corresponding to each radiating element into an electrical signal, respectively, and extracts a high frequency signal corresponding to each antenna beam, and supplies to each radiating element. (See paragraph [0018].) Indeed, Kobayashi clearly discloses that multiplexing is carried out and it is led to two

or more optical transmission lines. (See paragraphs [0031] and [0033].) Thus, in Kobayashi, the multiplexer 13 outputs a plurality of light beams to travel through different optical paths."

The Examiner disagrees. FIG. 3 of Kobayashi clearly teaches that the multiplexer 13 has a single output to lens 43_3. The "two or more optical transmission lines" mentioned in paragraphs [0031] and [0033] refer to the fiber bundle 48.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (6:30 a.m. - 4:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on 571 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

skl
7 October 2009

/Shi K. Li/
Primary Examiner, Art Unit 2613